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Ceutorhynchus new species. West Kansas.
Pelenomus sulcicollis Fahr. Lawrence.
Baris macer (?) Lec. Gove county (Snow).
Baris confinis Lec. Topeka and Lawrence.
Baris transversa Lec. West Kansas.
Baris tumescens Lec. Lawrence.
Baris striata Say.
Baris new species, near carinulata.
Baris pruinosa Lec. West Kansas and Lawrence.
Ampeloglypter Sesostris Lec. Lawrence. Injuries grape vines.
Microcholus new species. Topeka; two specimens.
Barilepton cribricolle Lec. Lawrence.
Barilepton quadricolle —. West Kansas.
Centrinus neglectus Lec. Lawrence.
Centrinus falsus Lec.
Centrinus prolixus —. West Kansas.
Centrinus confusus Boh.
Centrinus modestus Boh.
Sphenophorus ochreus Lec. Lawrence.
Sphenophorus æqualis Gyll.
Sphenophorus melanocephalus Fab.
Sphenophorus pertinax Oliv. Topeka and Lawrence.
Sphenophorus vomerinus Lec., var. baridiodes. West Kansas (Snow).
Sphenophorus placidus Say. Lawrence.
Hypothenemus hispidulus Lec. Topeka.
Hypothenemus distinctus Lec. Lawrence.
Micracis suturalis Lec. Lawrence.
Scolytus quadrispinosus Say. Lawrence.
Hylesinus aculeatus Say. Lawrence.
Eurymycter fasciatus Oliv. Lawrence.
Hormiscus saltator Lec. Topeka and Lawrence.
Anthribus cornutus Say. Lawrence.

A NEW METHOD OF DETERMINING THE WIND'S VELOCITY.

By John H. Long, Class of '77, University of Kansas.

It having been repeatedly stated by certain observers in Kansas that the anemometer of the State University registered a higher than probable velocity, I was induced at the suggestion of two gentlemen connected with the institution, to test the correctness of the instrument. The apparatus used by me was very simple, consisting essentially of a hollow copper sphere suspended in front of a graduated horizontal scale. But as a more detailed description may be necessary to the understanding of what follows, I will give it here. Imagine first a perpendicular shaft of iron, eighteen feet long, whose bottom fits into a socket and to whose top is attached a swivel. To this swivel are fastened several wires whose other extremeties are secured so as to give complete steadiness to the shaft. Other braces are attached for the same purpose, and the swivel on top permits it to turn

to suit the varying direction of the wind. A short distance below the swivel a horizontal arm, fifteen inches in length, is firmly attached to the shaft, and just below this another one is similarly attached. These two arms are equal in length and parallel to each other. To the extremity of the upper arm are fastened two fine iron wires, one, seventeen feet long, supporting a plummet, and the other, six and a half feet long, supporting the copper sphere mentioned above. The sphere is 8.5 centimetres in diameter, and weighs 135.92 grammes. To the extremity of the lower arm is attached the scale, consisting of two lath-like pieces of wood, about four feet long, fastened parallel to each other and about one-half inch apart. Between these, constituting a guide, the wires are suspended, and on the front one the graduation is made. The plumb line serves to determine the zero point, and is of no further use. By means of the swivel above and the socket below, the apparatus is easily turned, so that when the ball is deflected by the wind its vibrations may take place in the space between the two laths. The observation consists in registering the amount of this deflection from the zero point, or point in which the perpendicular line cuts the scale. It is well known that the force of the wind is not constant for any great length of time. It is hence necessary to take a great many observations, at short intervals, in order to obtain a correct mean. In my work I noticed the deflection of the ball through fifteen minutes, making a record every fifteen seconds, which gave me sixty observations for the quarter of an hour. The following table taken from my note book will illustrate:

June 19, 40 m. past	6,	def.=20	centimetres.		June 19, 41 m. past	6,	def.=16	centimetres.
40¼ "	6,	" 18	"		41¼ "	6,	" 18	"
40½ "	6,	" 20	"		41½ "	6,	" 19	"
40¾ "	6,	" 17	"		etc.			

Cup anemometer marked 15.24 m. per hour.

I observed always the record of the anemometer for the same fifteen minutes, and at the close of my work, which was continued on several days to obtain mean deflections corresponding to different velocities, I had a number of such records as the above, each consisting of the position of the ball at sixty different periods.

By a well known principle of mechanics I found the force or pressure of the wind necessary to produce in the ball of known weight the observed deflections, and for convenience made the following table:

For deflection of	1	centimetre,	force =	.73 gramme.
" " "	2	"	"	1.46 grammes.
" " "	3	"	"	2.19 "
" " "	4	"	"	2.92 "
* *	*	*	*	* *
" " "	60	"	"	43.80 "

Having this table of pressures, the next question is to find the wind's velocity corresponding to each of them. There are several empirical formulas, which might be applied to the solution of a problem such as this, but one proposed by Weisbach seems to be the most reliable. It is for the action of an unlimited stream, either of water or air, and by giving suitable values to some of its factors it affords an easy solution to the problem in hand. I do not know that it has ever before been applied in this way, but I find the results obtained agree very closely with those derived from a formula computed by Colonel James for the British Board of Trade. The formula is this:

$$P = z \frac{v_2}{2g} Fy,$$

in which P is the pressure of the wind, z a term dependent on the shape of the body exposed to the wind, $\frac{v_2}{2g}$ the height due to the velocity v, F the exposed area, y the density of the air. The value of z has been found from experiment to be about 0.64, so transposing the equation to find the value of v_2 we have,

$$v_2 = \frac{2g\ P}{.64\ Fy},$$

from which the numerical value of v can be easily found, as those of g, P, F and z are known. It must be observed that the value of z varies with the barometric height, making it necessary to read the barometer for each set of observations. It is now easy to construct another table, as follows:

For deflection	of	1 cen.,	velocity =	3.9	m.	per h.	
"	"	" 2 "	"	5.51	"	"	
"	"	" 3 "	"	6.74	"	"	
"	"	" 4 "	"	7.80	"	"	
*	*	*	*	*	*	*	*
"	"	" 60 "	"	30.2	"	"	

Finally these values are substituted in the columns of deflections observed, and a mean obtained which represents the wind's velocity for the fifteen minutes of observation.

After making a large number of experiments as above described, I learned these facts regarding the anemometer at the Kansas University: First, that it never registers too much; and second, that for small velocities it does not register enough. This is due to the fact that a gentle wind, whose strength, however, is sufficient to deflect the ball, will fail to move the cups sometimes for many minutes.

The following figures will show results obtained by both methods. The first column contains the velocities determined by the deflected ball, and the second those determined for the same time by the anemometer.

5.6 m. per h.	.64 m. per h.	15.3 m. per h.	15. m. per h.
10.5 " "	4.84 " "	15.6 " "	14.88 " "
11.68 " "	10.62 " "	17.5 " "	16. " "
13.5 " "	10.89 " "	18.2 " "	18.15 " "
13.7 " "	12.81 " "	18.7 " "	18.39 " "
14.7 " "	14.5 " "	20. " "	19.2 " "
15. " "	14.0 " "	25.3 " "	25.14 " "

It will be observed that for medium and high velocities the two methods compared very well, and for low velocities, as intimated, the anemometer fails to give a large enough record. Besides showing that the apparatus at Lawrence can not register too much, my observations have convinced me that the method is one which may be of value to meteorologists. From its extreme simplicity and lightness, the instrument may be easily carried from place to place by traveling observers, and a record of the wind's velocity at any station can be obtained in a few minutes. As a check upon another instrument it may be used to advantage as just shown. The dimensions which I have given are larger than necessary. I chose them in order to have the copper ball on a level with the cups of the anemometer.